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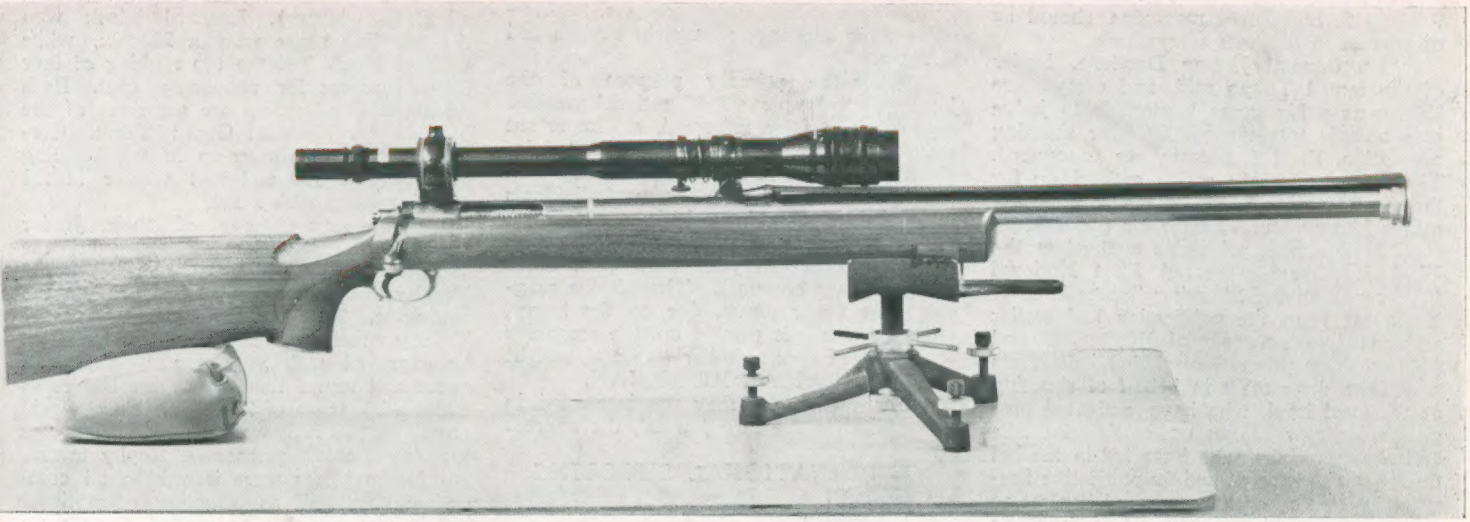
Precision SHOOTING



A heavy bench rest rifle with a Pride 1⅛ inch diameter barrel on a Weber action. Stock and metal work by John Warren of Eastham, Massachusetts.

A .222 Remington Magnum caliber, custom made rifle owned by Crawford Hollidge. The stock was made by Bob Stinehour of Newburgh, New York.

a magazine for Shooters by Shooters

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RECOGNITION FOR WORKERS

The following "news release" from FIELD & STREAM magazine should be of interest to shooters everywhere.

"Lt. General Jimmy Doolittle, leader of the famed Tokyo raid and everywhere known as a big game hunter, is to judge cash awards totalling $1800.00 for shooting promotion, Field & Stream has announced. The aviator-general's active enthusiasm for the development of safe and sane shooting makes him a natural choice for the task.

"In line with principles evolved at the Field & Stream-sponsored First National Conference on the Shooting Sports in New York last June, the publication had earlier announced cash awards of $1000, $500, and $300 to those promotion-minded individuals who have done most in behalf of shooting at the local level, who have activated programs for new ranges or establisehd rifle and shotgun clubs, who have led in the bat tle against unwise or unduly restrictive firearms legislaiton, or have worked hardest to provide places where youngsters can be given proper training with sporting arms—in short, the local 'take-charge guys' in shooting promotion. Cash was selected for the awards in the dual thought that some winners might wish to turn their reward back into local shooting activity, and that hard work merits tangible recognition.

"Entry is to come from those who benefit by this individual's effort, in the form of a 500-word letter of nomination, forwarded to Field & Stream Editor Hugh Grey (530 Fifth Avenue, New York 36, N. Y.) prior to April 15th. The letter should detail just what the local leader has accomplished, how he went about it. Announcement of the cash winners—and there are ten handsome plaques for nominees in the honorable mention category—will be made in late spring, followed by a full story in Field & Stream. This is a real means of rewarding the unsung heroes of the shooting game.

"Assisting General Doolittle in selecting winners will be Maj. Gen. Julian S. Hatcher of the National Rifle Association, Mr. James Dee, Shooting Promotion Director for the Sporting Arms and Ammunition Manufacturers Institute, and Editor Grey."

(Editor's comment: There are worthy nominee candidates for the aforementioned cash awards in every section of these United States; fellows and gals who have worked long, diligently and effectively to promote, foster and advance the shooting games. Those folks have worked to promote the shooting games as they have seen the need, from sheer love of the sport and with no thought of reward other than success for their efforts, but if some of them may receive a tangible reward and some wide-spread recognition for their work, that is just fine and dandy. We hope this judging team may be swamped with nominations, as it well should be.

We also think Field & Stream and its editor Hugh Grey should get the nod as real leaders in the Outdoor Publication field for real and effective promotion of the Shooting Sports.)

INTERNATIONAL SHOOTING SPORT

We have received the first edition of International Shooting Sport, the brand new official journal of the International Shooting Union, have subscribed to it, and fully expect that we will in the future be kept well informed about the Shooting Sports the world over.

International Shooting Sport is a real quality magazine, to be published six times a year by the International Shooting Union. All the content of the magazine, even the photo captions and advertisements, is printed in three languages; English, French and German.

While the primary purpose of the journal is to keep the ISU national member organizations fully informed, an important secondary purpose is to keep interested individual shooters in all nations equally well informed. Subscriptions from individuals will be accepted and, we believe, welcomed. The subscription cost is $3.00 (US) plus postage (inquire at your local post office about postage amount). Though the magazine has fewer pages, due to the heavy, quality paper it is printed on, the magazine would be of about similar size and weight as our AMERICAN RIFLEMAN.

For those who may be interested in subscribing to the new journal, the address is:

INTERNATIONAL SHOOTING UNION
Wiesnaden
Webergasse 7
Germany

TOURNAMENT CIRCUIT

WILLOWS, CALIFORNIA

Robert Wood of the Ukiah, California Rifle Team won the 10th annual Northern California Gallery Rifle Championship, sponsored by the Willows Rifle Club and fired on January 28th and 29th. Wood scored a 199 prone, 200 sitting, 200 kneeling and 190 standing for an aggregate of 789. He also scored 197 as a member of the championship Ukiah No. 1 team and with Irvin Brown 198, Rodney Palmer 196 and Kenneth Cummins 195, posted a 786 team total over the 5 shots in each of four positions course, 9 points over the runner-up Albany Rifle Club team. Wood's 200 score was tops in the kneeling stage and he was runner-up in the standing stage and third in the sitting stage.

A total of 126 persons fired in the match and the Willows Rifle Club had to express its regrets to the 40 advance entries that could not be accepted due to lack of space.

Gordon Taras of the Albany Rifle Team was runner-up in the championship aggregate with 787 and Victor Zimin of Santa Rosa was third with 786. Rounding out the "Top Ten" were Kenneth Cummins 784, Howard Forster 783, Dennis Schmidt 782, Chris Petersen 782, Irvin Brown 782, Carroll Collier 780 and Duane Jenner 780. Top in Expert class was Robert Leis 774; Sharpshooter, Wm. Felton

Bob Wood, Ukiah, California, winner of the Northern California Gallery Rifle Championship at Willows, Calif.

765; Marksman, Robert Bednar 750.

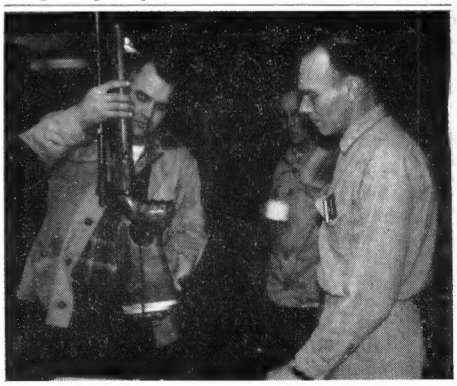
Glenn Johnson won the prone stage with 200-20x (a total of 49 200 possible scores were made in this stage, including all class winners). Leonard Block won the standing stage with a 200-19x, while Clifford Block had the top ranking of four 200-17x scores for runner-up spot. Both winner and runner-up are members of the Nevada Air National Guard Team. Gordon Taras was runner-up in the kneeling stage with a 199 and was winner in the standing stage with a 191.

In memory of one of their Junior shooters that passed away last year, the Willows Rifle Club initiated a Memorial Trophy this year for the high junior in the aggregate. The "Bud Jensen" Memorial Trophy consists of a plaque on which will be engraved each year the high junior's name and score, this year Jim Dawes of Chico with score of 748. The Trophy will remain at the Willows Club and the shooter receives a small permanent trophy award.

Name plates were issued to all competitors, as well as shooting promotional decals. In addition to medals there were 85 merchandise awards, some awarded by drawing and some by placing. The 30th Master and 25th Expert were each awarded a one year subscription to Precision Shooting.

Nearly half (56) of the shooters were in Master class. There were 32 Experts, 18 Sharpshooters and 14 Marksmen.

As established last year, all triggers were weighed in conformance to NRA rules. This year there was a little rumble from discontented people who would not come if triggers were to be tested. Fortunately, there were more than enough people that were willing to go along with the rules to fill out the shooting contest to range capacity.



Weighing trigger pulls, in conformance with NRA shooting rules, at the Northern California Gallery Rifle Championship tournament. Holding rifle is Virch Norleen, San Leandro, Calif.; in background, James Bryan, Cridley, Calif.; and at right, Official Referee Jess Gillum, Chico, Calif.

Representing one of San Francisco's oldest teams were the four Davy brothers, John, James, Frank and Louis Davy, all Masters and shooting together as a team.

From Reno, Nevada, representing the Air National Guard of Nevada, was the Block family, Bill, Nolan, Clifford and Kenneth. A fifth member, Clinton Block, was forced to stay home due to three broken ribs.

NRA SECTIONAL TOURNAMENT

The 1961 NRA Sectional Indoor Rifle Championship was fired on the Willows Rifle Club range (California) on February 25th and 26th with a capacity entry of 121 shooters, a record entry for this tournament. A sunny week-end contributed to drawing as many interested spectators as there were shooters, which is rather unusual, and they were able to see some excellent shooting.

Robert Wood of Ukiah, Calif., firing a 795, came within one point of tieing the National Record for this course of fire, a 796 set by Emmett Duncan on this same range in 1959. Bob had everyone in suspense as he went into his offhand stage only one point down, having fired a 200-20+5 prone, a 200-20x sitting and a 199 kneeling. All spotting scopes were on his target as he fired his offhand score, which was a winning 196.

Victor Zimin of Santa Rosa, Calif., was the high Master with an excellent 790. Vic was only 3 points down going into his offhand, which was a 193 to give him second place in both that match and the aggregate.

Donald Werner of Sacramento, firing a 200-20x+18x, was the winner of the prone match. Wood's 200-20x was high in the sitting match, in which nine 200 possibles were posted. Winner of the kneeling match was Ken Cummins, Wood's team mate from Ukiah, who fired a 199, with Bob coming in 2nd for the first and only time during the tournament.

Third through tenth in the aggregate ranking were: Irvin Brown 787, Clifford Block 786, Clinton Block 785, Kenneth Cummins 783, Alvin Rupe 782, Donald Werner 780, Leonard Brock 780, and Robert Stokes 780.

Competition for the team championship was very close with the Ukiah Gold Team of R. Wood, K. Cummins, R. Palmer and I. Brown making the win with a 1560 team score, Sierra Rifles from Sacramento in second place with 1559 and the Willows Rifle Club No. 1 team in third spot with 1558.

In addition to the usual medals awarded in this tournament by the sponsoring club, trophies were awarded to the winners of each of the four stage matches.

FLORIDA SMALLBORE MATCH

It was Mr. Burger Queen of Melbourne, Florida (KENNETH RECKER) who was king of the range at Dr. Archer's 10th Annual Winter Smallbore Rifle Tournament, January 29th, when he posted a 1591-95 score to win the grand aggregate only two points over veteran Junior, Billy Toursh of Miami. The tournament was conducted on Dr. Archer's private Pine Tree Range at Homestead, Florida.

Interesting to note about Recker's performance is the fact that he had been plagued by a chronic neck affliction for the past several years which had all but retired him from the shooting game. However, a certain Dr. Russell Elliott, Homestead chiropractor and friend of the tournament sponsor alleviated this condition by skillful manipulations.

IN CALIFORNIA . . .

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Topanga Canyon, near Santa Monica, Calif.

Then there was the matter of equipment which is all but impossible to describe. Mr. Recker had assembled an ancient bucket of bolts with parts of every conceivable description from outboard motors to baby carriages; welded together, glued together, shimmed, bolted, wrapped and all together placed in a monstrous club of sorts which faintly resembled a stock. The designer, Recker himself, claims it to be Australian numbo-dumbo wood but we feel that he doesn't quite know himself.

In any event, after much tinkering, bedding, adjusting, banging, assembling and re-asembling, often times during the firing of his record score, he did manage to get the clunker to hang together and shoot straight enough to win the tournament which, after all, is the primary purpose of the thing. The ammunition used was a lot of EZXS borrowed from the tournament sponsor. Although Recker is a veteran of many tournaments he had only one brassard affixed to the back of his shooting jacket; it consisted of one large printed word, "TENSION," which apparently didn't affect the wearer one bit.

Young Billy Toursh of Miami, Florida, himself a veteran of many tournaments and holder of several championships, won second place in the grand aggregate though compiled a higher "X" count than the winner by five, and it was this "X" count which delegated Lt. Craig Kern of the U. S. Air Force to third place with the same point score of 1589.

The contest for high Expert was closely contested between Michael Cochrane of Miami and another junior competitor, Maury Morse of Kendall, Florida, where again the winner had the higher point score and the second place the higher "X" count.

The tournament was held on two successive Sundays, January 22nd being reserved for the junior competitors of Mks and SS classes. Six of these hardy souls braved the coldest weather in the winter season to fire over a range covered with frost and unfavorable winds. Again the contest was close with Dale Wilson of Miami Springs in first place with 777-32x over Pete Eloff of Miami with 777-23x.

Tournament prizes consisted of trophies, medals, cash, merchandise awards and free entries for the forthcoming Sawgrass Championships in Miami, Florida. Contributors to merchandise awards were the Redfield Gunsight Co., Al Freeland Shooting Supply, Sam Bond Shooting Supply, Llanerch Gun Shop, Precision Shooting, Rig Products, National Gun Traders, Miami, Florida, and Burger Queen Restaurant, Melbourne, Florida.

INTER-SERVICE PISTOL MATCH

National Pistol Champ, SFC William B. Blankenship of U. S. Army Advanced Marksmanship Unit, won the individual Inter-Service Pistol Championship at Lackland Air Force Base, Texas, in mid-February with a 2641-120x score. Blankenship overcame the early lead of Capt. Franklin C. Green of Lackland AFB and beat the Air Force handgunner by five points. Marine Corps Sgt. Larry Hausman of Camp Matthews, Calif., took third place in the competition.

The Army "Blue" team from the AAMU won the team aggregate with a 3504 score, 17 points over the U. S. Air Force team. Army won the .22 cal. and center fire matches but lost the .45 cal. match to the Air Force by a slim two point margin.

The Marine Corps team posted a 3463 aggregate score for third place.

OHIO RIFLE LEAGUE

After eight matches the Miami Valley team remains undefeated in the eleven team Western Ohio Rifle League. Annie Oakley (Dayton), Miamisburg and Valley City were tied with five wins and two losses each.

R. Wright of Miami Valley team is the top individual scorer in the league, shooting consistently in the 290's for the course of 5 shots in each the prone and sitting positions and 10 each kneeling and standing. J. Cash of Miamisburg and J. Turnbull of Springfield are close to Wright with consistent 290 plus scores.

Ashland is undefeated after 8 matches in the 7 team North Central Ohio Rifle League. Galion has 8 won and 1 lost while Richland-Gasco has 6 won and 3 lost. The league course of fire is 10 shots in each the prone, kneeling and standing positions. The better individual scores run in the top 280's to lower 290's. W. Jamison of Richland-Gasco fired one score of 295.

CONNECTICUT LEAGUE

Rippowam is undefeated for 11 matches in the 8 team Southern Connecticut Rifle League and Cos Cob has won 10 and lost 1. The league shoots a 5 shots in each of 4 positions course. High individual scores run in the 195-196 range and no one individual appears to be outstanding in the "high score" department.

The Information Bench

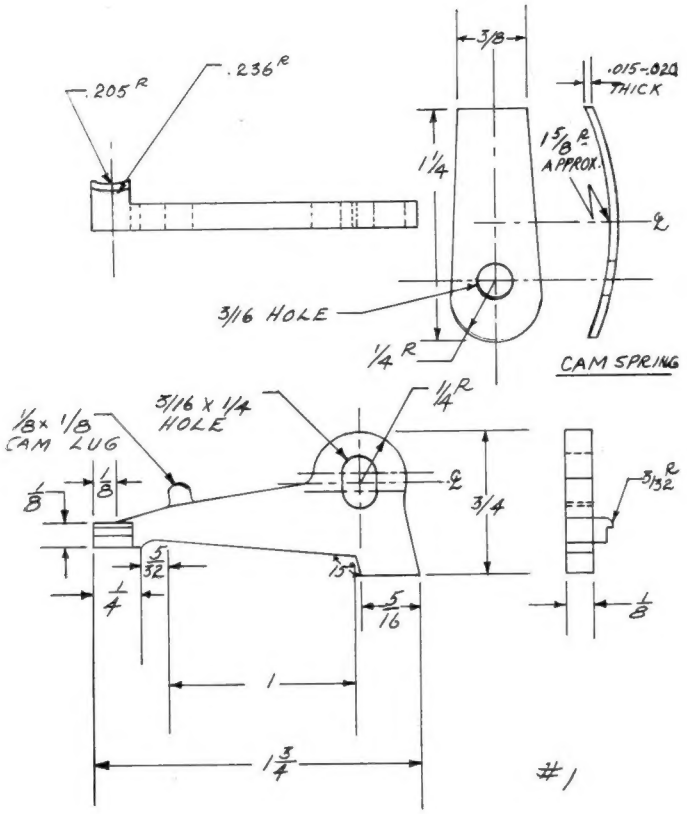
The Information Bench service is available to all Precision SHOOTING readers. With your questions, send a stamped, self addressed return envelope for a reply. Selected questions and answers, covering as wide a variety of interests as possible, will be published in these columns. Address your questions to the following people.

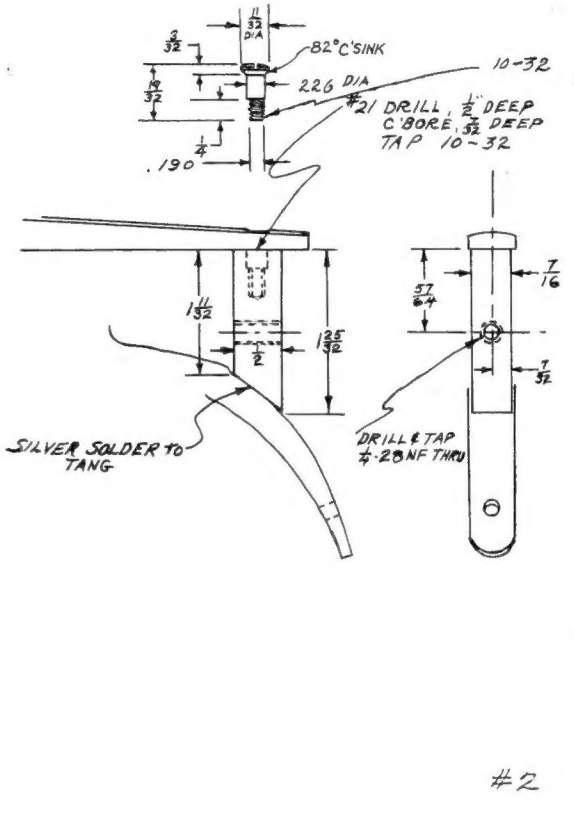
Rifles, all types, accessorise, handloading, components and shooting methods:—R. W. Lathrop, The Information Bench, 3207-148th Ave. S. E., Bellevue, Washington.

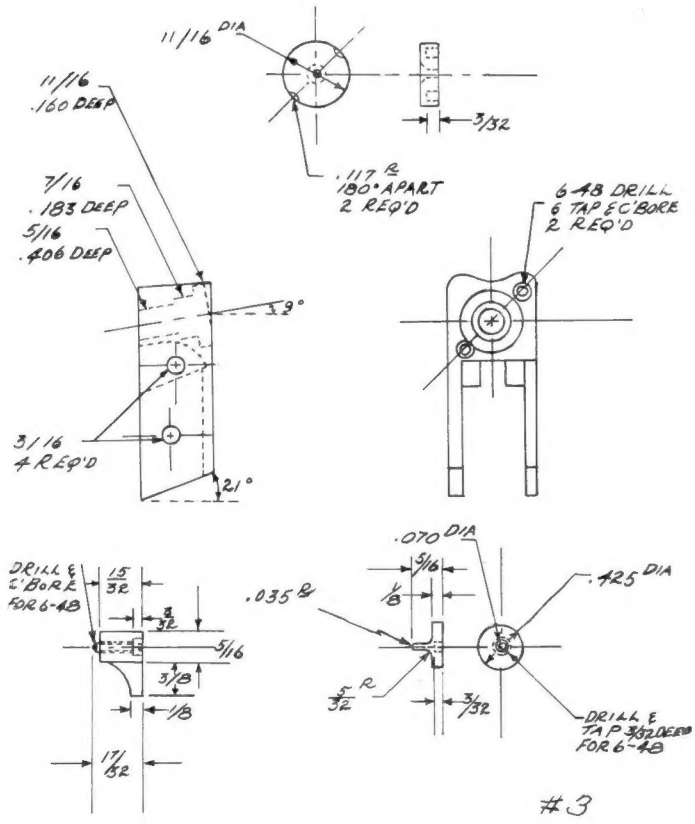
Sporting handguns and loading—Kent Bellah, Saint Jo, Texas.

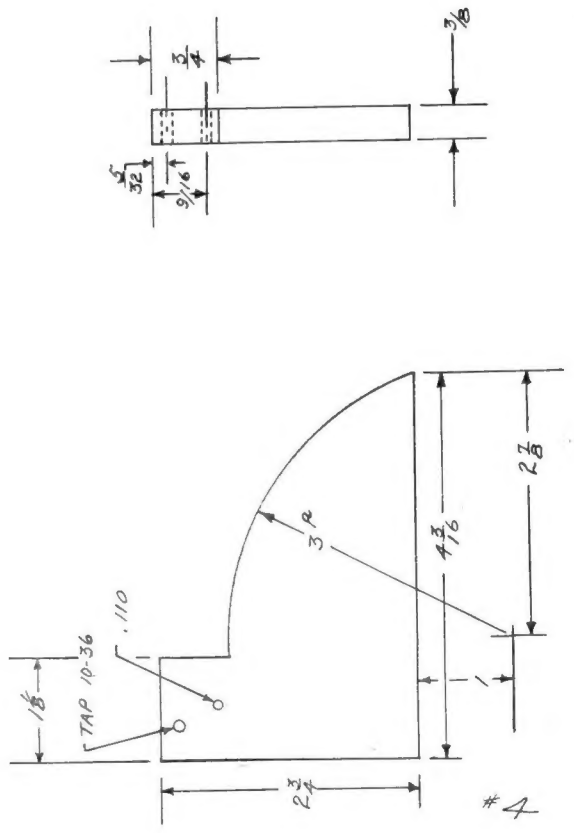
Question: I recently received a copy of the 1961 NRA Smallbore Rule Book, and iln the section at the back on Free Rifle Shooting there is a description of the maximum amount of padding that may be used on the shooting jacket. According to this the regular 10-X shooting jacket is illegal in some respects, and yet I have seen photos of American and Canadian shooters at the Olympics and they appear to be using a 10-X jacket.

(Continued on Page Fourteen)









CONVERSIONS FOR WINCHESTER SINGLE SHOT ACTION

By K. E. Smith

No. 1 This is a modification for converting the Winchester Single Shot to rimless case extraction. Also the cam lug may be used to an advantage for rimmed cases, and of course leaving the extractor its original thickness.

No. 2 A modification to pistol grip and draw bolt through stock. Special screw is made from old tang screw, which acts as dowell and screw. The gun may be easily disassembled using this method. Care should be used when drilling the stock for draw bolt and ¼°—28 tapped hole should be marked and added **AFTER** the drilling of stock. A blacksmiths drill seems to work the best for me to prevent drill from drifting off location. The stock is best drilled between center and drill on a lathe.

No. 3 A modification of breech block and firing pin as a gas safety feature.

No. 4 This is merely a bending jig for shaping the lower tang. Fill the threaded lower tang hole with weld (steel) and dress off before bending.

CAVITATION IN RIFLE BORES

By Jesse M. Grigg

Dear Phil:

Herewith "Cavitation in Rifle Bores," which describes the situation as I see it after having given the matter much time in study and research that included a review of the physics of heat, chemistry of gases, heat transfer, mechanics of materials, thermodynamics, and fluid mechanics, and as well use of gun catalogues, hand-books, and periodicals.

You will agree that the accuracy of the finding depends on the accuracy of the data employed. The latter is somewhat open to question, as there are so many contributing factors such as time, rate of combustion, heat radiation, bullet inertia and friction, that the state of conditions just as the bullet is getting under way is more a matter of conjecture than is what happens later on. But when in doubt I have chosen the conservative figure so that, if error occurred, the finding would err on the side of conservatism.

Jesse M. Grigg

AMONG the minor causes of barrel damage is bullet friction, whose wear is almost negligible with lead bullets, but is not quite negligible with jacketed ones. Among the more serious hazards in the life of a barrel is the accumulation of hard fouling, which may lead to irreparable damage owing to subsequent blowby. Most destructive of all, and most unavoidable is the cavitation which occurs in those rifles whose chamber throats are not sealed in advance of firing. This description as to throat includes just about all rifles excepting the .22 rimfires with match chambers.

The friction drag of a bullet equals the product of the coefficient of friction and the pressure exerted by the bullet on the bore surface. The work which is converted into heat equals the product of this resistance and the length of the bore. A jacketed bullet exerts on the bore surface many times the pressure exerted by a lead one, not only because the jacket metal requires more pressure to groove it, but also because the jacket metal, in passage through the bore, wears itself away at slower rate.

A published figure shows for a German army rifle the friction force of nearly 100 pounds needed to move the bullet during firing. At this rate, due to friction, the mean temperature rise in a 2 foot long, 3 pound barrel may equqal .4° F. and the rise in a 190 gr. jacketed lead bullet may equal 130° F. These figures of course do not include the heat imparted by the propellant gases.

A published figure for the wear of a British .303 caliber match barrel states that 2,000 rounds increased the diameter over the lands .001" according to measurement with steel plug gauges. The manner of measurement indicates that this was the wear at the tightest place. The amount indicates that the friction wear of a jacketed bullet is not negligible; but the claim that, as a source of inaccuracy, it is negligible in comparison with throat damage, no doubt is true. Nonetheless it indicates that forcing a jacketed bullet through a barrel without lubrication, even if unavoidable, is basically wrong. It is comparable to operating a machine with dry bearings, although the faster wearing jacket metal does correspond to the faster wearing, replaceable linings of the machine bearings.

From the fact that copper jackets do wear the bore surface it may be reasoned that they wear it unevenly. Between muzzle and breech there is a diameter difference due to temperature difference in the course of firing. Further, the barrel steel may not be homogeneous as to hardness to resist wear. On the other hand, the tendency of the tightest places to wear the fastest is off-set by the tendency of metal fouling to accumulate fastest at these places.

It has been claimed that the rate of copper deposit in a bore is almost nil. In regard to this, examine some tool whose surfaces are finished bright, and perhaps you will discover faint parallel marks which have been left by the grinder. A lead bullet rubbed in the direction of the marks may leave no trace; if rubbed crosswise it writes a distinct line. Similar effects in lesser degree are noted if a piece of copper is used in the same manner. The experiment proves that passage of a bullet through a bore will leave a deposit of metal fouling unless the bore surface is flawless.

Though a lead bullet wears away rapidly, copper and gilding metal have the name of wearing away slowly, perhaps because copper particles are more easily displaced than detached. This fact is apparent to one who has drilled or tapped copper. A drill is easily burned, or a tap broken because the copper particles tend to cling to the parent body. Nevertheless, to believe that copper fouling is deposited, one needs only to whet his knife blade a few strokes on a copper rod.

The deposit of metal fouling plus surface wear leads inevitably to one of the conditions by which bore damage is caused. This condition is unevenness of bore. The other condition is failure of the bullet to seal the bore in advance of firing. Each condition, independently of the other, permits blowby to occur, and the result is the kind of damage which is commonly, but perhaps erroneously, called gas erosion.

As the heat of the propellant gas may almost rival that of the acetylene cutting torch, it might be supposed that the principles underlying metal cutting and bore enlargement are the same. This is not true. The acetylene torch, with a flame temperature of 5,500° F., heats the ferrous metal to the temperature at which it burns in oxygen, and with additional oxygen supplied, burns it to iron oxide. The temperature of the propellant gas may not much exceed 5,400° absolute, which is not enough to fuse the barrel metal in the short interval of exposure, nor even produce the bright heat that is needed to form scale. Thus, to account for damage to the bore, it is necessary to pursue a different theory.

In fact, before any plausible theory may be settled upon, it is necessary to explore the various leads and learn of each whether it is quantitatively capable of being a cause. To proceed with this, I shall employ data which, in its thermodynamic elements, is based on the old .30-06 load. For this, nearly as can be determined or estimated, the conditions which obtain as the bullet enters the forcing cone are shown in what follows. As the force which is needed to seat the bullet is about 200 pounds, evidently the gas pressure at this time is that which exerts this force. So it is conservatively assumed that the pressure is 200 atmospheres, or 2,940 p. s. i. Perhaps the temperature is about 4,800° F. absolute. The mass density in the chamber, equaling unit weight divided by 32.16 is about .03636 at this temperature and pressure, this figure being a prorated one which is based on the weight of charge, volume of the bore and case, and pressure at the time of bullet emergence. The length of the blowby passage, based on the length of the bullet bearing cylinder, is about ½".

It is well known that high velocity is gained when a gas, compressed air for example, escapes from a reservoir through a small orifice. Temperature, volume and pressure undergo radical changes whose proportions depend on whether heat is lost to the orifice wall. My calculations for the blowby passage indicate that only a small fraction of the heat content in the gas is lost through the barrel wall; so the assumption of expansion without loss of heat in the passage is allowable.

As the walls of the escape passage are sensibly parallel, and the pressure difference between the case and the atmosphere is sufficiently high, the acoustic or sonic (sound) velocity for the gas will be attained, and it will be the velocity in the passage. Acoustic velocity is always proportional to temperature, but change of pressure will not change it. The effect of pressure increase is merely that of increasing mass density so that the gas, still at acoustic velocity, has in it more of the kinetic energy that is capable of doing damage in suitable circumstances.

To approximate the relations between velocity, pressure, and temperature by calculation, I assumed that the ½" long escape passage surrounds a .308 caliber bullet with .005" clearance all around at a place where the outside barrel diameter is 1". Thus the outside diameter of the escape passage is .318", and its circumference is about 1". For outside temperature 60° F. was chosen.

The temperature rise of the bore wall may at best be only approximated, as it involves gas temperature, rate of pressure build-up, and distance of bullet travel to seat. Calculation with estimated data indicates that the resulting rise is only a few degrees for 1/16" of bullet travel to seat. This heating of course is apart from the subsequent rise that is due to presence in the bore of gas at higher temperature and greater volume for a longer time.

The blowby velocity is more easily obtained. For the assumed data, my figure is 3,756 f. s., an acoustic velocity, this figure being an approximation because it is based on approximated data. Nevertheless, it will serve well enough in the following analyses of the forces which are the result of blowby.

The dynamic force in what is commonly called gas blasting may be nothing else but the aerodynamic drag which is associated with the escape of gas at high velocity. Very nearly, the inertial part of this force on the throat will equal the product of velocity squared, times the mass density, times the sine of the angle at which the forcing cone tapers, times the projected area of the forcing cone ridge in square feet. The sine of the angle will be about .024, and for the assumed data the projected area of the ridge will be .005 square inches.

The product comes to .24 lbs. of drag by a blast which moves at 3,756 f. s. If the blast continued for one second the work done would equal 903 ft.-lbs. But the duration is only about .00023 second. Thus the inertial drag will expend only about .21 ft.-lbs. of work on the surface. That the heating effect will be negligible becomes apparent when it is stated that this work is capable of raising the temperature of one pound of iron only about .002° F.

According to an example in Robinson's "Thermodynamics of Firearms," the friction drag due to viscosity in the gas will be far less than the inertial component. Thus the effects of blasting may be summed by saying that both the effects of drag and

(Continued on Page Six)

Cavitation in Rifle Bores

(Continued from Page Five)

heating are less than the corresponding effects of bullet friction itself. Therefore, if bullet friction is ruled out because it is a minor cause of barrel damage, so also must the heat and drag effects of the escaping gas be ruled out.

However, these inconsequential effects are only the palpable ones. Less tangible is a potentiality of another kind and origin which, in suitable circumstances, could lead to what truly is throat erosion. Suppose that, due to some mechanical cause such as friction, the cone surface becomes roughened so that here and there isolated particles stand up above the average level of the surface. Because of inability to transfer heat these isolated particles might be freed by fusion, or because of precarious hold be blown away in the blast. The rate of such erosion might be very small; but maybe it is not too fantastic to believe that it could occur.

Now, barring the possibility of erosion due to surface roughening, all the leads thus far investigated have proved inconsequential, and perhaps erosion due to roughening also is inconsequential. Thus is shown again that an obvious conclusion cannot be taken at its face value. Not only must it pass the test in comparison and analogy, but also it must be quantitatively capable.

In "Bullet Fit and the Bernoulli Theorem," June 1960 issue, I was guilty of employing the notion of gas blasting, owing to failure on my part to investigate quantitatively a theory which apparently fitted too well to be false. Now, having found it wanting, and myself compelled to seek other cause, I believe that the principal source of the damage is a mechanical situation of exactly the same type as the one in which a barrel is ringed. Close investigation substantiates this belief.

In Fig. 1, (a) denotes a bore in which, owing to lack of bullet fit, gas is blowing past the bullet. All the above used relations between velocity, pressure, temperature, and dimensions are supposed to exist.

In (b) is denoted the mechanical situation which obtains when the bullet has advanced far enough to seal the passage. As this occurs, the end of the gas column at the shoulder b is brought to rest, and behind it other sections of the column crowd one upon another, like the crowding which occurs when the motion of fluid in a pipe is arrested by the sudden closing of a valve. In a plumbing pipe the effect is called "water hammer."

As the stopping shoulder is part of the barrel, the velocity which is arrested includes not only what was gained in the orifice, but also the basic velocity in the gas from which the orifice velocity sprang. In fact, at the shoulder, all velocity is lost, and all the energy in the gas, excepting the momentum energy, becomes pressure energy in accordance with the Bernoullli principle. Thus exists in miniature a situation of the same type in which a barrel is ringed. The resulting pressure may not be great enough to stretch the steel beyond its elastic limit, but the kinetic energy in the arrested momentum is expended on the narrow shoulder with a unit force that may be capable of causing permanent deformation.

To get at the matter quantitatively AA and B'B in Fig. 2 supposedly bound a section of the passage in which gas velocity is brought to zero by an abrupt closure on the line AB. This closure corresponds to sealing of the bore in a forcing cone, or subsequent sealing at a place where the bore has become enlarged.

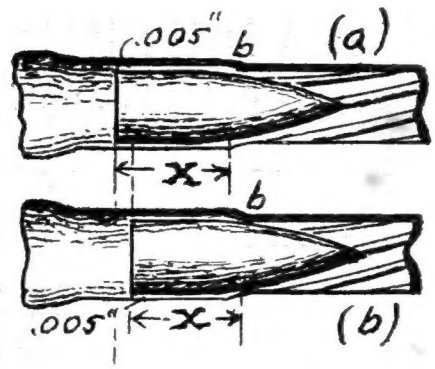


FIG. 1

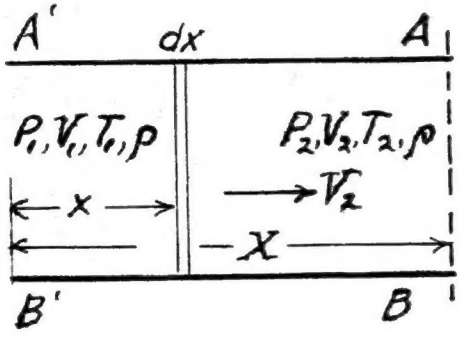


FIG. 2

The expression for the momentary sum of heat content, pressure energy, and kinetic energy per unit of volume in the blowby passage is shown in Eq. (1) below. The expression for kinetic energy in unit terms per length of passage at the instant of sealing is given by Eq. (2). Thus

$$H + P + \tfrac{1}{2}\rho V^2 = \text{Constant} \quad \cdots (1)$$

$$K.E. = \tfrac{1}{2}\rho X V^2 \quad \cdots (2)$$

Here H, P, and V respectively denote heat content, pressure, and gas velocity. Greek letter Rho denotes the mass density, which for the data in this discussion equals 58 per cent of the mass density in the chamber. X is the length of the column whose motion is stopped, this length nominally being the length of the bullet bearing cylinder. These equations are applicable also to the case of an obstructed bore in which the bore itself corresponds to the blowby passage.

When the equations are applied to the sealing of a forcing cone, velocity V becomes zero when the bore is suddenly sealed, and pressure in the passage becomes pressure in the case. The energy yielded by Eq. (2) is expended on the shoulder of the forcing cone.

For X and V equaling respectively ½" and 3,756 f. s. the momentum which is suddenly stopped bears with a force in which 41.67 ft.-lbs. per square inch of surface is expended. On a shoulder which is .005" high and 1" around the expended energy is .2083 ft.-lbs., and on a segment of this shoulder which is .005" square, the prorated energy is .00104 ft.-lbs.

Now a peculiar situation exists. In all directions in the passage the pressure 2,940 p. s. i. is exerted. In one particular direction the kinetic energy .2083 ft.-lbs. is expended on the shoulder which sealed the passage. The pressure merely stretches the bore, presumably without deforming it. The kinetic energy blow, exerted in one direction only, and striking only a small area, tends to deform the surface as would a center punch or a chisel.

A center punch compresses no metal. Instead it raises a dike around a crater. It may raise the dike because the punch itself pushes down only where the crater is formed. For this reason, while pressure will merely stretch the bore wall, only a tiny bit of directed kinetic energy will sink a crater or form a gash.

A .25 caliber pointed and hardened steel boat-tail bullet in my possession weighs about 100 gr. or .014 pounds. Dropped from a height of one foot it gains the kinetic energy .014 ft.-lbs. Dropped .9" it gains the energy which the example above shows to be expended on a surface .005" square. The diameter of a circle having the area of this square is about .0056". Accordingly, I flattened the point of this bullet so that an .0058" filament laid crosswise would scarcely hide the point. For test the bullet was dropped through a .9" long tube to a piece of discarded barrel. The effect was a dent which could be found with a glass. Also a dent was made when the bullet was similarly dropped to a flat surface of mild steel.

This experiment indicated for the data above that the kinetic energy per unit of surface is capable of producing a deformation when at least one dimension of the surface is small. The unit force is the same whether the shoulder is .001" or .005" high. Thus it may be supposed that this unit expenditure of work on the shoulder will leave an annular trace, or groove. Being at the forward end of the passage, the groove will have the effect of slightly enlarging and forwarding the forcing cone. Ralph F. Pride gave to this advance the appropriate name, "throat recession." Considering that a glancing blow may be struck, the advance per shot may be slight, but repetition will tell.

Friction and heat perhaps are attendant circumstances. Jacket friction is at its maximum in the forcing cone; moreover, as the throat surface becomes rough, roughness not only augments the friction force, but also renders the surface more susceptible to wear, and possibly susceptible to heat and blast erosion of the type which has herein been suggested.

According to all reports, heat of firing contributes to the rate of deterioration. Perhaps it does so by weakening the resistance of the steel. A reliable text-book states that the strength of steel decreases up to about 200° F., increases from 200° to 500°, but above 500° continually decreases. Moreover, the same text states that the elastic limit, which is the pertinent factor here, in all zones seems continually to decrease as temperature rises. For an experimental test of heat effect, I fastened a 5/16" mild steel rod rigidly at one end, hung a suitable weight on the horizontal free end, and heated an intermediate point to a temperature that would barely melt soft solder—about 500° F. Abetted by heat, the load put a permanent set in the rod.

As this experiment and the quoted text indicate that even moderate heating lessens the resistance of steel to permanent deformation, evidently weakened resistance is the reason why the rate of cavitation increases rapidly with the rate of fire. Some specific figures for the rate itself of throat recession are given in Ralph F. Pride's fine article, "Of Bullets and Barrels," which appeared ni the November, 1956 issue of Precision SHOOTING. Therein also he states for

the .224" groove diameter that an oversize bullet seated to enter slightly into the lands makes for longer barrel life.

Referring again to Eq. (2) it is observed that the kinetic energy which does the damage is proportional to X, which in the forcing cone is nominally the length of the bullet bearing. Thus, as the bullet bearing cylinder is comparatively short, the momentum in the blowby passage is comparatively small. But when the equations are applied to an obstructed barrel, the momentum in the gas column is proportional to the distance of the obstruction from the breech, and the volume of the gas is vastly greater. Further, as the pressure itself becomes the usual bore pressure plus the normal kinetic energy converted to pressure, the sum of all three forces may quite strain the barrel beyond the elastic limit.

Rifles for .22 rimfire are chambered for match shooting so that the bullet is seated in advance of firing. This practice so effectively obviates the escape of gas in the throat that many years of use may not enlarge the throat excessively. Nevertheless, even with the low pressures of such rifles, cavitation may occur at any other place where an enlarged bore permits gas to escape. This is so because the principles which apply to blowby in the forcing cone apply also to any other place where gas escapes. Proof for the .22 rimfire is evinced in the fact that the use of shorts in a long rifle chamber leads to extraction difficulties. Also it was proved to me by the fact that a few hundred more rounds in a slightly ringed barrel so much enlarged a faint swell that an unfired case would enter after the barrel was sawn in two. In this phenomena perhaps the slowing of the bullet at resumption of constriction has somewhat the effect of an obstruction in the bore. At any rate, the rapid decline after a slight damage to this barrel highlighted the importance of keeping the rifled portion of the bore of any rifle free of pockets which permit the escape of gas. The forcing cone is saved from quick ruination by its nearness to the chamber.

As to forcing cone damage, apparently nothing may be done to prevent escape past the bullet in the throats of present day center fire rifles. But if gas hammer is the principal cause of the damage, a palliative might be one which is based on the principle that in water hammer closing the valve less suddenly deadens the shock. In the firearm this would require that the bullet seal the bore a little at a time. The slowing maybe could be accomplished by use of a deformed bullet whose section, instead of being round, were very slightly eccentric at and just behind the place where the ogive normally touches the lands as the bullet starts to move. If the eccentricity were imparted with a die in advance of loading the case, possibly its symmetry would be restored in the course of upsettage in the bore.

In further defense of the gas hammer theory, it is stated for the data used herein that .005" for clearance around the bullet was chosen for simplicity in description and experiment. Some no doubt will object that .005" much exceeds the actual clearance in the neck of the .30-03 rifle chamber whose tolerance, I believe, is only about .0035". Anyway, the amount of clearance used in the example has very little bearing on the validity of the argument. The unit force on a surface is the same whether 10 pounds is exerted on one square inch of surface, or one pound is exerted on 1/10 of one square inch.

Finally, if it has been proved that gas

(Continued on Page Fourteen)

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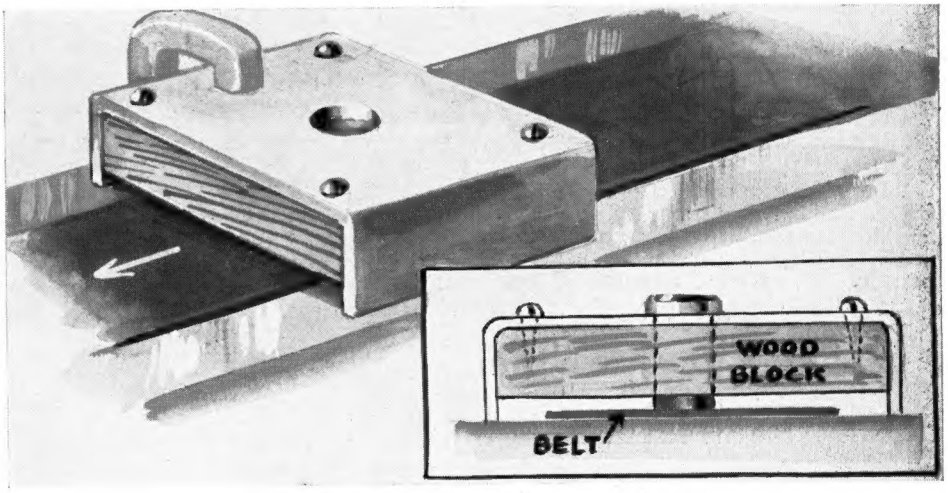

A simple, homemade cartridge case trimmer

A SIMPLY MADE CASE TRIMMER

by William E. Peterson

In reloading for the Model 1917 Smith & Wesson revolver, as well as for other revolvers chambered for the .45 ACP cartridge, trouble may sometimes be encountered if a cast semi-wadcutter bullet is used which is even very slightly oversize, as it will prevent the cartridge entering the cylinder bore quite far enough to insure free cylinder rotation.

If you are using the standard rimless .45 auto case, you will just have to get a new sizing die. However in reloading with the convenient, easily extracted .45 autorim case, in which the rim controls the seating depth of the cartridge, all you need do is to trim five thousandths off the lip of the case.

An easy way to do this, assuming you have available that handy tool, a belt grinder or sander in which the abrasive belt runs over a platen, is to make a block as illustrated, drilled for the case, the sides of the block to rest on the platen on each side of the belt. These supporitng sides are carefully ground on the bottom edge so that when a cartridge case is pushed all the way down in the hole in the block as far as the rim will permit it to go, the moving belt will have ground off the excess from the lip of the case.

Most belt sanders use a belt practically as wide as the platen. However a belt can be ripped down its length, reducing belt width to allow plenty of room on the platen for the supporting sides of the block. The belt used on this job—a Metalite 320-grit, product of Behr-Manning, Troy, N. Y., trimmed three hundred cases with no perceptible wear.

Operation is quite fast, requiring no chucking of each case, but simply shoving the case down into the hole until the belt can take no more off. The fit of the case in the hole should be barely loose enough to permit the case being pulled out with hte fingers, but should be no looser. The block may be clamped to the platen with a C-clamp if desired, but I have not found this necessary.

It would seem that this trick could be used to trim rifle cases as well as handgun cases, using a hole bored to fit the case, the shoulder of the case being the depth control.

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THE PRESIDENT'S CORNER

This is to **ALL MEMBERS;** those who are active in shooting, our observers and associates.

I am sure that every one in our organization would like to see it grow to a position of active competition in every state and become a major National Organization. This is no dream but to become a reality it requires the participation of all.

The N. B. R. S. A. can well be proud of its contributions to the shooting world. The accuracy of today's rifles is something that was only a dream 10 or 12 years ago, and the things that produced this accuracy were originated and perfected in the ranks of the N. B. R. S. A.; and this is almost without exception. With these accomplishments behind us and a world-wide field ahead of us, we have much to accomplish and something to offer new members who familiar with the rules, equipment, sports-

This brings us to the question, how do we build our organization? Let us consider the facts: No one is in a better position to present that which we have to offer a new member than our members. **YOU** are familiar with the rules, equipment, sportsmanship, fellowship and pleasures derived from our sport.

This brings to mind that I reminded you in my first column (Jan.) that it is your organization and that it will grow according to what you as individuals will do for it. **SO,** let us put our efforts in the form of an old rally day slogan, "Each one bring one." By this, I mean that each member look around you; there are many who would join our ranks if they have some one to inform them and serve as their guide until they feel at home.

At this point; if there is any one who has been an observer and would like to become an active shooter, do not hesitate to approach an active shooter and ask for help. There is one thing that is most outstanding in our sport and that is the willingness to help each other, freely explaining anything new that has helped accuracy (and some things that did not), and making things for each other that are not available anywhere else.

Bench Rest shooting is, to me, the most fascinating sport I have ever attempted. It, too, can be most exasperating, but this is a challenge to the shooter who has the will to say "I CAN DO IT!"

This is the perfect time of the year to start a new member in our sport so let's see what we can do to build the N. B. R. S. A.

Until April,

Bob Hart

COMPETITOR ACCOMMODATIONS AT THE NATIONAL SHOOTS

NATIONAL VARMINT RIFLE CHAMPIONSHIPS: The Reed's Run Rifle Range will be open for practice and familiarization firing for two days and evenings before record shooting begins on July 21st.

There is room and facilities for both tent and trailer camping on the club grounds. Meals will be served in the club house throughout the practice and championship shooting, July 19th through July 23rd. There are good motels and restaurants within six (6) miles of the range.

For specific information and arranging for reservations, address Reed's Run Rifle Range, P. O. Box 66, Augusta, Ohio.

NATIONAL UNRESTRICTED RIFLE CHAMPIONSHIPS: The Pine Tree Rifle Club range is normally open for familiarization firing for one or more days and evenings before any of their registered bench rest shoots.

There is ample room for both tent and trailer camping on the club grounds and convenient to the firing line. Meals are served in the club house throughout match periods. The club house has a comfortable lounge, bar which is open evenings only, and toilet and wash-room facilities for competitors.

The Pine Tree range is located midway between the twin-cities of Johnstown and Gloverville. There are hotels, tourist homes and restaurants in each city and motels in the near vicinity.

For specific information and arranging for reservations, address the Pine Tree Rifle Club, Inc., Johnstown, New York.

1961 BENCH REST MATCHES

GULF COAST REGION

San Angelo, Texas: May 27 and 28; Texas State Bench Rest Championship (unrestricted bench rest rifles); (Mrs.) Marie Spencer, Box 1243, San Angelo, Texas.

San Angelo, Texas: August 12 and 13; Texas State Varmint and Sporter Rifle Bench Rest Championships; (Mrs.) Marie Spencer, Box 1243, San Angelo, Texas.

MID-CONTINENT REGION

Wichita, Kansas: April 8, May 13, July 1-2, and Sept. 30; Wichita Bench Rest Rifle Club, Larry Engelbrecht, Sec'y, 122 Gow, Wichita 3, Kansas.

Kansas City, Kansas: June 3, Aug. 5, and Oct. 21; Mill Creek Rifle Club, Inc., L. F. Carden, Sec'y, 2211 North 44th St., Kansas City 4, Kansas.

Tulsa, Oklahoma: Apr. 16, May 21, June 17, July 15, Aug. 19, Sept. 16, and Oct. 21; Tulsa Bench Rest Rifle Club, Inc., E. A. Anderson, Sec'y, 3604 So. Toledo, Tulsa, Oklahoma. AD TO 1961 Bench Rest Matches

EASTERN REGION

(Unrestricted Rifles)

Augusta, Ohio: April 15-16, May 27-28, June 17, Aug. 19, Sept. 16-17; Reed's Run Rifle Range, P. O. Box 66, Augusta, Ohio.

Plainfield, New Hampshire: May 21, July 15-16, Sept. 17; Plainfield Rifle Club, Leslie R. Stone, Plainfield, N. H.

Easton, Ohio: June 10-11, July 29-30 (Ohio State Championship); Chippewa Rifle Club, Nelson Berger, Sec'y, R. D. 1, Box 192, Marshallville, Ohio.

Southboro, Mass.: June 25, Aug. 13, Oct. 15; Southboro Rod & Gun Club, J. W. Baldwin, P. O. Box 402, Westboro, Mass.

Lewistown, Pa.: July 1-2 (Eastern Region Championship); East End Blue Rock & Sportsmen's Club, P. J. Aurand, Milroy, Pa.

Dryden, New York: Aug. 26-27 N. Y. (State Championship); Dryden Fish & Game Club, Russ Cuatt, Sec'y, 113 Park St., Ithaca, N. Y.

Johnstown, New York: Aug. 31 and Sept. 1-2-3 (National Championship); Pine Tree Rifle Club, Inc., Johnstown, N. Y.

(Sporter and Varmint Rifles)

Augusta, Ohio: May 6-7, July 21-22-23 (National Championships); Reed's Run Rifle Range, P. O. Box 66, Augusta, Ohio.

Dryden, New York: May 14, June 4 (N. Y. State Championship), Aug. 5-6 (Eastern Region Championship); Dryden Fish & Game Club, Russ Cuatt, Sec'y, 113 Park St., Ithaca, N. Y.

Fassett, Penna.: June 18, July 9, Aug. 20, (Penna. State Championship), Sept. 24; South Creek Rod & Gun Club, Gerald Arnold, Sec'y, 111 N. Halett Ave., Horseheads, New York.

Easton, Ohio: June 10-11, July 29-30 (Ohio State Championship); Chippewa Rifle Club, Nelson Berger, Sec'y, R. D. 1, Box 192, Marshallville, Ohio.

NORTH CENTRAL REGION

Custer, South Dakota: May 21 (Sporter & Varminter), June 17-18((Sporter & Unrestricted), Aug. 12-13 (Varmint & Unrestricted); contact Walt Siewert, Custer, South Dakota.

Buffalo, Wyoming: Apr. 16 (Rimfire Match), May 7 (Crow Shoot), July 15-16 (Unrestricted and Heavy Varmint), Sept. 10 (Sporter), Buffalo Outdoor Rifle Club, Martin Pelloux, Sec'y, Clearmont Rt., Buffalo, Wyo.

Iowa Falls, Iowa: Unrestricted rifles, night shoots—May 6, June 10, July 8; Sporter and Varmint Rifle—May 7, June 24, July 9, Sept. 10: Iowa Falls Rifle, Pistol and Trapshooting Club, Inc., Verle W. Hunt, Sec'y, Ackley, Iowa.

A CORRECTION

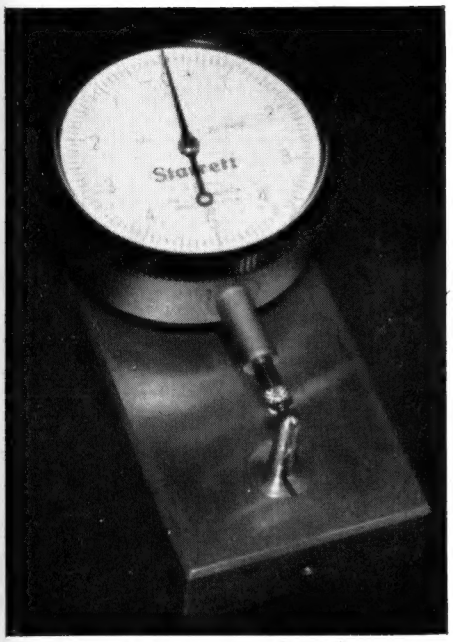
The editor made an error in the first paragraph of the report of the Eastern Region Winter Meeting at Elmira, New York (February issue, page 10). The new club which became an NBRSA affiliate at that time was the South Creek Rod & Gun Club with range at Fassett, Pa., some 10 miles south of Elmira, N. Y. That club will conduct registered Varmint Rifle matches during the 1961 season (see match schedule). The club secretary is Gerald Arnold, 111 N. Halett Ave., Horseheads, N. Y.

Shortly prior to the Elmira meeting a club in the Philadelphia area did become a NBRSA affiliate; the Hidden Valley Shooting Ass'n with ranges at Pomeroy, Pa. While that club has not as yet scheduled any registered bench rest matches they do have bench shooting faciltiies, and plan to increase those facilities. The club secretary is George Greller, 6900 Buist Ave., Philadelphia 42, Pa.

BULLET JACKET WALL THICKNESS TESTER

Cline Deere

This jacket tester (see illustration) is the idea of W. T. Hopfengardner of Dayton, Ohio. I made a change only in the location of the indicator point. My indicator checks closer to the base of the jacket wall than his indicator does. I believe that



A bullet jacket wall thickness tester.

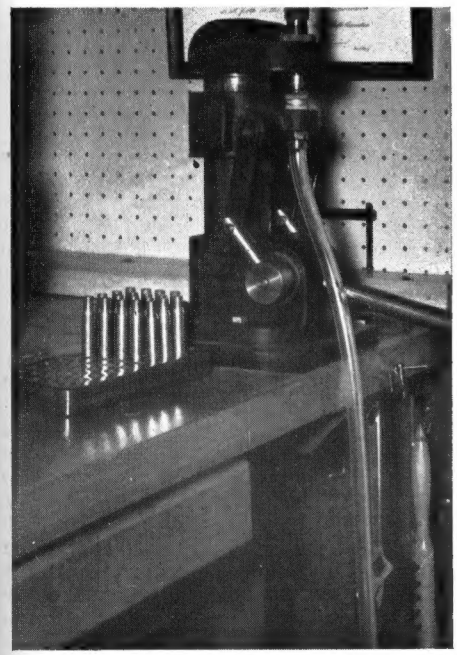
the base is the correct place to check wall thickness uniformity.

I have a tester that has two indicators and I can check two points simultaneously, one close to the base and the other close to the mouth. I pay no attention to the one at the mouth.

I agree with Bill Cotter regarding the .0004 TIR (Oct. 1960 P. S., page 15-16). I have made quite a number of tests and I have obtained practically the same results as Bill. It takes more than a couple of groups in any test to get the correct answer.

Another stake can be substituted and the wall thickness and uniformity at the neck of cartridge cases can be measured the same as bullet jackets.

I do not make these jacket testers for sale.



A primer catcher for a Hollywood press.

A PRIMER CATCHER FOR HOLLYWOOD PRESS

A foolproof primer catcher for the Hollywood Tools can be made by slipping the desired length of ⅜ inch ID Koroseal tubing made by Goodyear over the threaded portion of an old shell holder, removed by a hack-saw, or over a piece of bar stock machined with a ⅜ inch central hole and ¾ x 22 thread.

The opposite end of the tubing can be simply plugged to hold the spent primers, or it may be directed into a tin can with a ⅝ inch hole in the lid or directly into a waste bag or waste paper basket.

The threaded piece with tubing attached is quickly screwed into or out of the nut holding the shell holder with one-quarter turn.

Bruce Romig
Allentown, Pa.

CONSTRUCTION OF A BENCH REST

THE OBJECT of the bench rest is to eliminate the human error, so far as possible, from our shooting. Unlike the machine rest, a bench rest can be instantly adapted by any shooter to any rifle. It also permits the rifle to jump, vibrate and recoil in a normal manner, which a machine rest does not do. A bench rest, such as shown in the sketch, can be easily and cheaply constructed by anyone and has been proven by years of use to be a satisfactory design.

The ground on which the bench is placed should be level, and the top of the bench should be 34″ above the ground. It is 4′ wide in front, 5′ long, and 16″ wide at the rear. From a point 2′ behind its front edge its sides are formed in a curve to meet the 16″ width at the rear.

Three steady posts or legs support the bench top, two in front at the front corners, and one in the rear. These can be log posts 6″ to 8″ in diameter, or 6″ x 6″ timbers. They had better be about 5′ long so that they can be sunk about 2′ into the ground. Their falt tops should be 32″ above the ground level so when the 2″ table top is added the total height of the bench will be 34″. To locate the posts, establish a center line direct to the target. Place the two front posts with their centers about 18″ to the right and left of this center line, and the rear post squarely on the center line and about 4′ behind a line connecting the two front posts. Using 2″ x 6″ or 2″ x 8″ planks, spike these to the outer sides of the posts to connect each front post with the rear post. The tops of these two planks must be even with the tops of the posts, level, and 32″ above the ground.

The top of the triangle thus formed provides the base on which to nail the 1¾″ or 2″ planks, planed smooth on the top side, for the bench top. The shape and dimensions of this top are shown in the sketch. Make the top level from side to side and front to back. If the site of the targets should be above or below the site of the bench, nevertheless make the bench top

(Continued on Page Ten)

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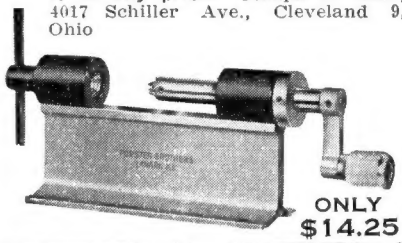

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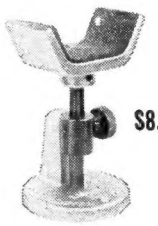

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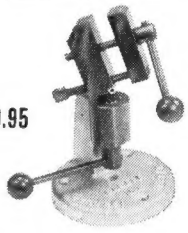

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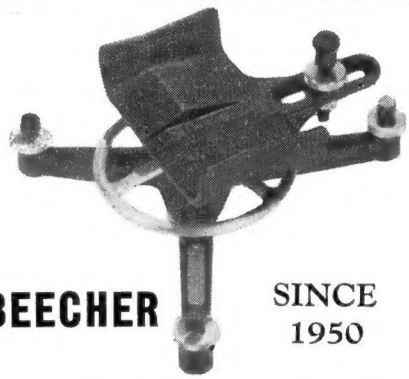

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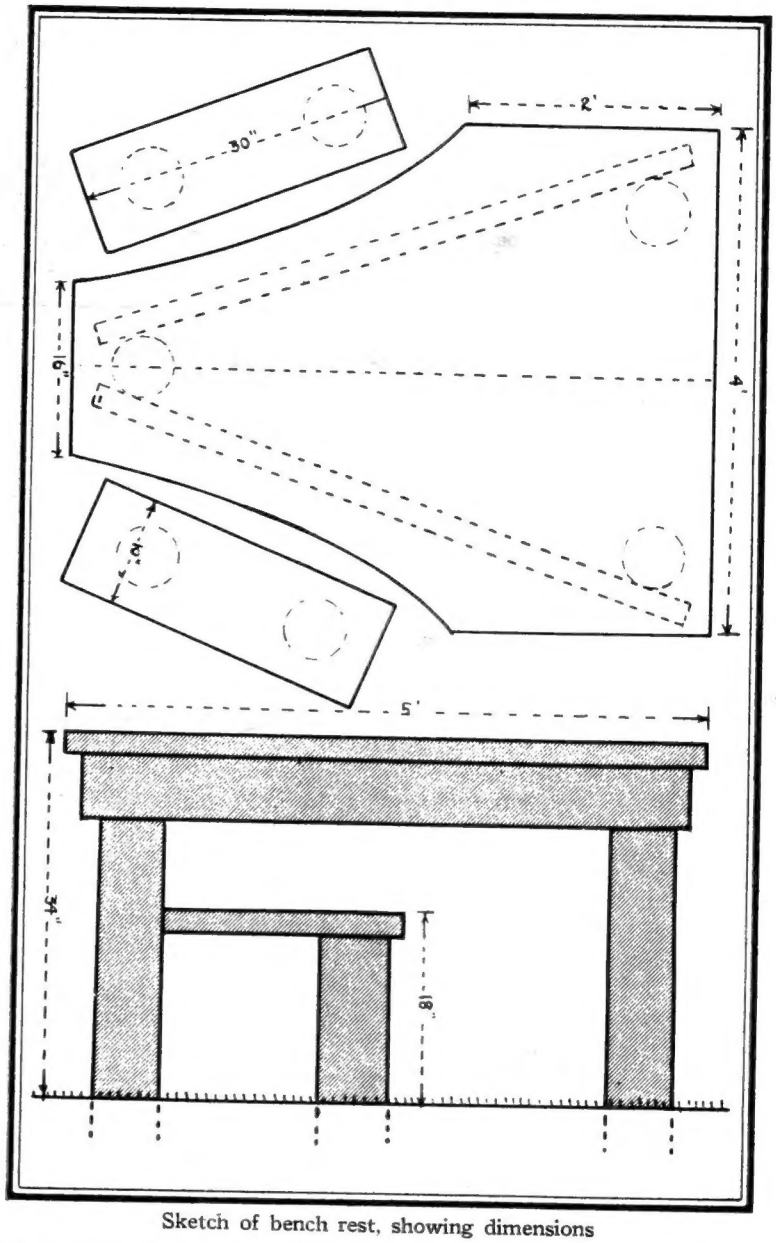


Sketch of bench rest, showing dimensions

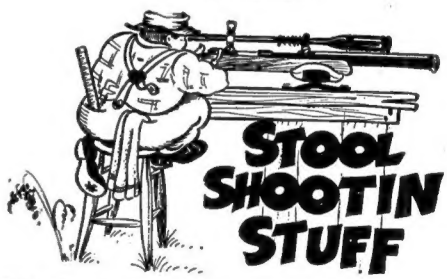
Construction of a Bench Rest

(Continued from Page Nine)

level and not sloping up or down to line with the targets. Paint the bench top a dull dark green. **Do not put linoleum on the top.**

Provide two firm benches for the shooter to sit on, one for a right and the other for a left hand shooter, located as shown in the sketch. These are best made by planting two sturdy posts in the ground and spiking a 10" plank on top. The plank seat should be about 18" above the ground and about 30" long. Such a steady seat is better than a stool or chair. Neither the bench nor the seat should shake a particle in any wind that the shooter is liable to shoot in.

On this bench the rifle is rested on two sandbags so that it points approximately at the target. The forearm of the rifle rests on the front sandbag several inches in rear of the tip of the forearm, and the under edge of the butt-stock, about half way between pistol grip and butt-plate, rests on the rear sandbag, all at such height that the toe of the butt-plate will be at least an inch above the top of the bench. The required height for the front sandbag is obtained by placing it on a block of wood, small wooden box, or one of the manufactured adjustable pedestals available at dealers. Sandbags should be made of closely woven fabric or pliable leather so that the sand will not sift through.



STOOL SHOOTIN' STUFF

Dear Phil:

The February issue of the magazine impressed me with the great interest that is characteristic of our group as we year by year search for greater accuracy. It was clear from some of the articles that much progress has been made in trying to find out what the things are that really count towards getting a rifle to shoot as near as possible to one diameter hole groups of 5 or more shots.

Al Angerman's recap of the group and aggregate records was particularly interesting and I think it would be fine if we had to go along with it a record of the guns which were used in making these group records. Perhaps, too, there are some de-

tails that could be compiled indicating the changes which have occurred in types of actions.

In going back over some historical records of shoots of long ago, I am impressed with the likeness of shooters habits between those days and the current ones. It seems that always when a winner developed his type of equipment, his feat immediately led many others to presume that it was the equipment which contributed the major features to the win.

I doubt if such was the actual case in the older days and I do not believe that today a mediocre shooter would do much better with one of the winners' combinations of equipment than he had been doing with his own. The reverse is certainly true also. A good shooter could probably take almost any gun on the line and do quite well with it unless there was something radically wrong with the rifle.

It is interesting to note at the matches how quickly an experienced shooter recognizes that something has gone wrong with his equipment. In such a case the first few shots out of a rifle alarm him and he immediately searches for trouble. These troubles may be in any one of a half dozen or more locations and he quickly double checks the areas where trouble occurs.

Angerman's article brought out how a tiny variance in canting could affect the point of impact. No matter how careful a man handles his rifle he is going to suffer from a built in variation of canting if he has a rest which is not stable and steady. A loose adjusting screw in the center of the stand or on one of the legs, will cause him trouble if after recoil the rest bumps to one position and then, on a successive shot, bounces to another. The same holds true if the shooter places his gun on the stand 5 inches in back of the fore-end tip for one shot and then, on successive recoils, allows the gun to almost fall off the stand. To counteract this, some fellows use a stop on the stand. These stops are very advantageous for a beginning shooter but variation, which is the result of uneven pressure against that stop, will clearly show up in the size of the group, and if by chance the gun does not touch on that forward stop, the group will immediately reflect such an occurrence.

Presuming that one has a good stand which is well dug into the bench and with no looseness, a fellow will probably do better to use a visual reference method for determining the point at which he rests his fore-end. I found it very convenient to just put a little piece of electrician's plastic tape folded in an inverted "T" shape and apply to the side of my stock and a similar "T" shape application placed on my rest so that I come back to almost exact location at each firing. In the early days I attempted to use a permanent marker on the stock against a correspondingly permanent marked location on the rest. This effort was abandoned when I found how different the benches were from one range to another or, in the case where we used progressive bench positions, from one bench to another.

Indeed it is very necessary to take into consideration these variations that occur in benches if you are going to do much competitive shooting. A good rest must incorporate precise adjusting features of considerable latitude because it does no good to have a fine rest and have to mount it on 2 or 3 odd boards or scraps of wood that you might pick up along the firing line in order to achieve the latitude of movement that is required due to bench changes or range changes.

I must plead guilty to being stupid enough in one season to have shot for a long time with a scoep that could not be depended upon and I have known a number of shooters who have gone nearly all the way through a match without having the clamp mount screw properly positioned and tightened. Sloppy mounting of scope blocks, mounting holes not correctly drilled and tapped, permits them to loosen up sometimes right in the middle of a match. Precaution against trouble in the midst of the matches should be taken at the beginning of each day's events. You do not have to remove your scope from the blocks to tell this as it can be detected by both eyesight and your sense of feel. If you are suffering from two groups on your targets, this scope trouble might be the cause and if the two groups suddenly change to a scattered pattern, the chances of your having mount trouble are very great.

The practice of returning the scope to zero by hand with a slight twisting motion is one which we earlier learned as part of our shooting technique but I sometime ago conducted an experiment in which experienced shooters drew back their scopes by hand against measurements on a very sensitive dial indicator. It was amazing how varied these positions were, even at a time when the shooter knew that his uniform physical effort was being measured. It is perfectly clear to see that under the tenseness of match shooting conditions, this variation of physical effort and therewith a greatly different placement of the scope tube results in ragged groups. The automatic return to zero features which the shooters are building into their scopes are proving themselves worthwhile.

(Continued on Page Twelve)

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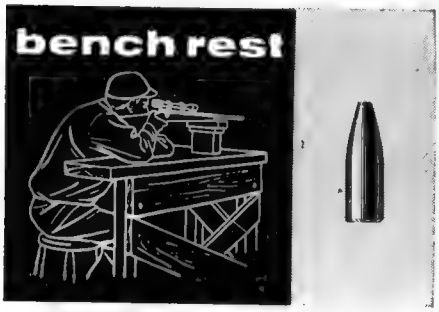

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Emory Tooly, Dolgeville, N. Y., and his .45-70 bench rest rifle. The half-dollar coin held near the muzzle by Bob Snowball gives an indication of the diameter of the barrel. Emory hasn't shot the rifle in bench rest competition yet but it won't surprise any of his friends if he does do just that.

Stool Shootin Stuff

(Continued from Page Eleven)

I liked Angerman's tests on the various weight cases and have long endeavored to try to assemble cases of similar physical characteristics for match work. Weight is not the only condition to take into consideration. Cases which do not have the rims turned down to a concentric and uniform condition will also adversely affect accuracy and in cases where the extractor bears against the extractor groove in one instance and not in another, our accuracy suffers. Normally most shooters consider it necessary to turn down only the rims when making .219 Don cases but the thickness, diameter and concentricity of other types of cases bears watching. Of course sizes and concentricity of the flash hole should be considered.

Have you examined recently your locking lugs and cleaned out carefully the recesses in which they engage? This can be a source of considerable trouble, especially if you find that one lug is bearing harder in its recess than the other. The result could give you a lot of trouble, and in the case of very high powered rifles, can be dangerous. An unbalanced condition on those two lug faces could easily be ascertained by wiping a little of your wife's lipstick on them and noting the result after you closed the bolt on a case which has been fired in your own rifle and not resized. Try it, too, with a factory load. You may find quite a variation. I have seen rifles go sour when these locking lug surfaces became galled.

You have been told many times about the necessity of proper screws and the tension on them in the receiver and that they, like the bolt handle, should never touch against the wood of the stock.

The news of the Elmira meeting, as far as official action is concerned, has reached you by way of Bob Hart, and when you publish the new shooting schedule at the same time as this column, the readers will be interested to see the greatly increased interest indicated for varmint matches. I cannot help but think back many years through which Colonel Whelen and I fought shoulder to shoulder trying to get interest for matches and in the development of rifles that were of a more practical nature than the highly specialized ones which currently are being used in bench rest. It is indeed an understatement to say that the accuracy obtainable from the lighter rifles, even through the sporter classes, is enlightening. It is downright amazing to find how small groups they will shoot when the accurizing developed by the benchresters is applied even to rifles as light as a hill and brush country hunting rifle.

We all at Elmira had the pleasure of seeing and talking to some of the representatives of the Remington Arms Company who brought to the meeting a factory box containing one of their rifles from the new "custom varminter line." I certainly think they are justified in expecting a good sales volume on these rifles. Of course, it will never equal the "plinkers" but there are so many good features being built in to this new rifle that a purchaser will at last be able to obtain a rifle that will compare favorably with a deluxe custom job that his neighbor has had built.

I feel that I am seeing developed before my eyes a situation akin to a couple of generations ago when some of us shooters were building crystal or one tube radios. At that period, there were practically no commercial sets and for a few short years after, we were able to build sets that would outperform those that we could buy. The industry developed so fast and so scientifically that in later years no sensible radio enthusiast could help but admit that the factories were doing a better job, at but a fraction of the money that was being laid out by the amateurs. So it has gone with the .222 cartridge, next the .222 Magnum, and now the new rifles by Remington.

Phil, I think your article on hollow point bullets can bear reading and re-reading, and I note that much of it follows very closely the brochure and reports of Ray Biehler. I got the impression that you considered the modern method of do-it-yourself bullet making as a soft swage method. I do not so consider it. Hardness tests show that the bullets are packed more firmly than are those available from many commercial manufacturers. It is my opinion that the soft swaged bullet is practically obsolete and I credit my friend and shooting pal, Jonas Hallgrimsson, with having done most to cause its demise. Many years ago he proved by the use of a

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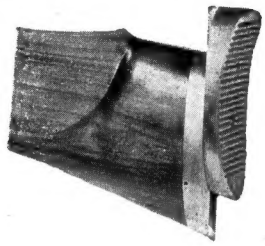

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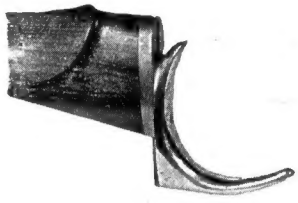

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storng chemical solution which dissolved the outside jacket and left the lead core perfect in its shape and form within the jacket, that there was all too frequently an air space between the jacket and the core. In this instance, not only was the jacket sometimes loose but the location of this air space could frequently cause the bullet to be out of balance. His design of the modern core forming die and the principle of expanding up was modified by a few manufacturing details or advantages which Ray Biehler provided when Jonas went to him to solicit the manufacture of the early die line.

Many amateurs do not even form their cores, although some of them now seat a carefully cut and possibly weighed slug of core wire, but I have found by using the old Jonas system of dissolving the copper jacket that such a system is prone to leaving the disastrous air space. Trapped air can also be formed if swaged cores are too large for the jackets in which they are being inserted, and if the home bullet maker is going to go beyond the .22 caliber stage, he is faced with the expense of core forming equipment to exactly match his jackets and punches that assure the proper seating of his cores. Because of the taper in the jackets, various weights of the same diameter bullet will require a corresponding selection of the core seating punch for practically each variation of weight.

(Continued on Page Fourteen)

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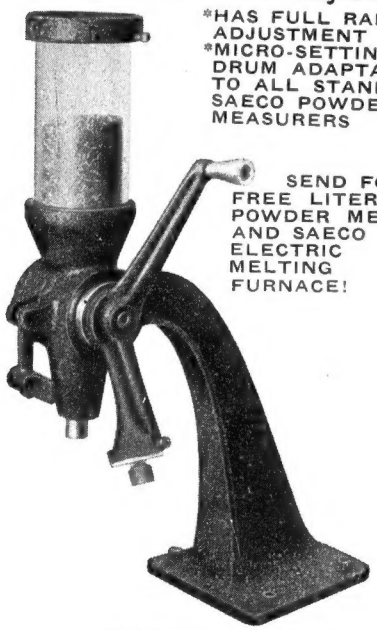

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Cavitation in Rifle Bores

(Continued from Page Seven)

hammer is the primary cause of throat recession, then in its original nature the damage is deformation, not erosion; the latter is defined as decimation due to gnawing or wearing away of a surface. However, the author admits that the notion of gas erosion might not be the phantasy that cold figures make it out to be. The paradox of water wearing away a stone was resolved with the discovery that carbonic acid in the water chemically dissolved the lime in the rock. Shoe leather decimates a stone step grain by grain because a roughness renders the surface vulnerable. A leather strop puts a keen edge on a razor because the leather fibers are able to snag the upstanding particles of the steel. So it is possible that irruption of the bore surface by deformation and friction upturns particles that are either burned or blown away.

LATER COMMENT:

Dear Phil:

Since "Cavitation in Rifle Bores" was mailed, it has occurred to me that close students of Dr. Mann will argue that recurring upsettage precludes blowby at places of bore enlargement. To counter this objection I make the following statements.

First of all, the fact of bore enlargemen,t by permitting gas to reach the side of the bullet, militates against recurring upsettage. Still more forbidding is the fact that a time element is involved, just as in all motions. This is to say a definite relation exists between degree of upsettage and velocity of bullet. Thus in the throat, where bullet velocity is negligible, upsettage is full whereas adown the bore, where velocity is appreciable, a bore enlargement is passed in less time than is needed for upsettage to occur.

The deformations of 32-40 bullets, which Dr. Mann profusely described and pictured in relation to his short barrel experiments, all occurred in the near vicinity of the breech block, and in general, as the book states, occurred in full because unburned powder acted as a gas check. Moreover, for this caliber he found that upsettage ceased to occur at between 10 and 11 inches from the breech. My calculations for the .22 long rifle indicate that bullet velocity at one-third the way through the bore would carry the bullet many inches in the time that would be needed for upsettage to increase the bullet diameter .001 inch.

Finally, the blowby theory is supported if not proved by the formation of pockets in barrel mid-sections, and also by the fact that these become larger. With pockets forming in my barrels in spite of all I can do, I wish I had the peace of mind to believe that recurring upsettage instead of blowby occurs at these places.

Jesse M. Grigg

Stool Shootin Stuff

(Continued from Page Thirteen)

I can add to your comments about hollow points because of some tests I have made. Because I am quite a 7 m/m enthusiast going back over a long period of years, I have made many experiments with home made bullets in that caliber. I made up a benchrest rifle to compare the accuracy of the various weights and types of bullets and during some of those tests, I checked for penetration as well as the blowup effect of the bullet. I quickly found that the performance of the average weight jacket when closed up to a fine open point was in every detail that I could observe the equivalent of a solid point bullet, if the lead was brought up well into the point. Indeed the thickness of the copper is so increased by the point swaging operation that it exceeds the thickness in lots of solids. It is my experience that the lead in a hollow point should be close to diameter depth below the point if good balance is to be obtained, and thus I am finding best accuracy at about 52 grains for a .224 caliber bullet made from a .705" jacket or 73 grains for a 6 m/m bullet in .827" jackets. 87 grain 6 m/m's need a longer and heavier jacket and the currently available jackets for .30 caliber are not long enough to make bullets much beyond 150 grains and still obtain the one diameter depth air cavity.

This air cavity depth as the openness of the point is increased seems to go hand in hand with the blowup characteristics of the bullet as it penetrates game, and so we are faced with opening up the point if we are going to obtain better killing power at short or medium ranges, but close it up if longer ranges and maintained velocities are essential. KEEP the lead line at the point of best bullet balance. Shorten or increase jacket lengths as you change weights in a diameter and put every bit as much care in your varmint or game bullets as you would in your target bullets if you are going to get the best out of them.

Cordially yours,
Ernest Stuhlschuter

The Information Bench

(Continued from Page Three)

Can you explain this apparent discrepancy? To be specific, is the 10-X jacket legal and acceptable to the I. S| U.? If not, where could I obtain a shooting jacket that will conform to I. S. U. rules? Warren Wright, London, Ontario

Answer: I have never followed International shooting very much and thus I do not personally know about these regulations. However, I am very fortunate to have as a good neighbor Mr. Roy Dunlap, who is one of our best informed men on this subject. Roy tells me that the rules say the padding must not be more than 8 millimeters thick on elbow and shoulder. The 10-X coat is thereby legally ruled out. However, he also states that the whole matter is up to the judge of the match and that many times they raise no objecttion to the 10-X coat. Roy (Roy F. Dunlap, 2319 Ft. Lowell Rd.,

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Tucson, Arizona) does sell many shooters supplies and I secured for you a circular showing an International coat made in Germany. I saw these coats and they are very good. R. W. Lathrop

Question: Will you please give me information on the "6 m/m International." I understand there are two versions, one by Donaldson and the other by Mike Walker. What cases are used in making these, as well as dimensions? A. J. Belisle, South Hadley Falls, Mass.

Answer: There may be several versions of a so-called 6 m/m International case but I believe that the one properly called the International is the regular .250 Savage case as worked out by Mr. M. H. Walker of Remington. To all intents and purposes this is the .250 case simply necked to 6 m/m. The shoulder is 26 degrees and the neck is about .375" long. This case shoots about 36 grains of 4064 with a 90 grain bullet at about 3200 fps. Some shooters have used the regular .219 Donaldson case opened up to 6 m/m. This case will take roughly five grains less than the .250 case. Precision shooting for November 1958 carried a drawing of the Walker case but it is so near like the Savage .250 that one does not need a drawing to realize what it is like. R. W. Lathrop

Question: I want your opinion as to the most desirable spotting scope for high-power or military .30 cal. target shooting. I like the angle eye-piece because it is less fatiguing, especially at 600. I feel that the choice is limited to the Buhl or the Unertl but I have never noticed a Unertl at any match. Also, the 90° eye-piece doesn't seem to be as convenient. Silas Foss, Newark, Del.

Answer: It is my belief that there is no best spotting scope, like there is no best gun or best cartridge. There are a number of very fine scopes and it is what one likes best for their particular use. The Bausch & Lomb line, the Bushnell line or the Unertl line are all on a par so far as I know. The Bushnell 45 degree Spacemaster might fit your needs very well. A very good listing of prices and specifications of all spotting scopes is to be found in the 1961 GUN DIGEST. R. W. Lathrop

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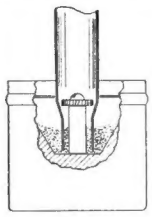

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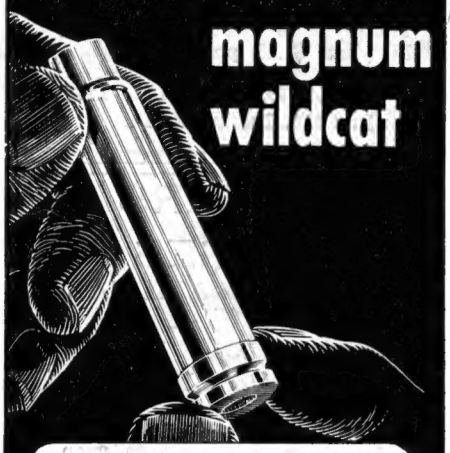

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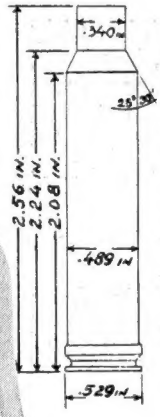

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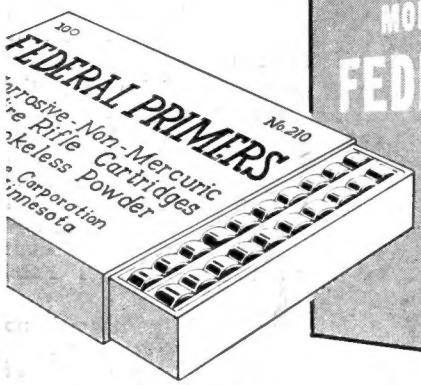

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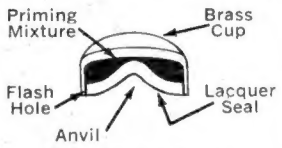

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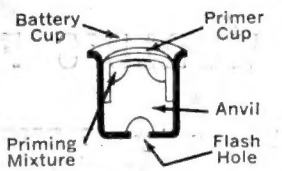

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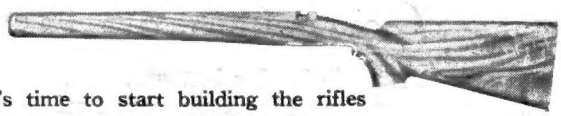

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